Soyuz 24 Return Samples: Assessment of Air Quality aboard the International Space Station

International Space Station: Fifteen mini-grab sample containers (m-GSCs) were returned aboard Soyuz. This is the first time all samples were acquired with the mini-grab samplers. The toxicological assessment of 15 m-GSCs from the ISS is shown in Table 1. The recoveries of the 3 internal standards, ^{13}C-acetone, fluorobenzene, and chlorobenzene, from the GSCs averaged 75, 97 and 79%, respectively. Formaldehyde badges were not returned on Soyuz 24.

Table 1. Analytical Summary of ISS Results

Module/ Sample	Date of Sample	NMVOCs[a] (mg/m^3)	Freon 218 (mg/m^3)	T Value[b] (units)	Alcohols (mg/m^3)
Lab	12/21/10	6.8	100	0.27	5.8
JEM	12/21/10	6.9	140	0.26	6.1
SM	12/21/10	7.9	73	0.28	6.0
Lab	1/14/11	4.7	67	0.27	3.9
Col	1/14/11	4.9	60	0.29	4.0
SM	1/14/11	5.0	68	0.31	4.0
HTV2 (**first entry**)	1/27/11	15	95	**2.50**	6.0
JEM	2/14/11	5.3	82	0.33	4.1
Lab	2/14/11	5.7	79	0.33	4.5
SM	2/14/11	5.1	67	0.29	4.1
ATV2 vestibule	2/25/11	5.0	67	0.33	3.9
ATV2 center (**first entry**)	2/25/11	11	8	**1.23**	5.3
Col	3/15/11	5.5	62	0.35	4.3
Lab	3/15/11	5.4	67	0.32	4.3
SM	3/15/11	5.0	54	0.34	4.1
Guideline		*<25*	*none*	*<1.0*[b]	*<5*

[a] Non-methane volatile organic hydrocarbons, excluding Freon 218
[b] Based on 180-d SMACs and calculated excluding CO_2, formaldehyde, and siloxanes. First entry guideline is < 3.

The T-values of samples taken during nominal operations suggest uniformly clean air. The first entry samples show higher levels of pollution, but <3 units. Based on Freon 218 and CO_2 levels, the ATV first-entry sample was captured quickly, but the HTV2 first-entry sampling was delayed. The main contributors to the high T-value in HTV2 sample were trimethylsilanol and fluorotrimethylsilane. Freon 218 (perfluoropropane) levels continue to be high and fairly uniformly distributed throughout the ISS stack. This compound is far from toxic at these levels.

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Enclosures
Table 1: Analytical concentrations of compounds found in the Soyuz 24 return m-GSCs
Table 2: T-values of the compounds in table 1